AMENDMENTS TO THE CLAIMS:

1.(Original) A method of forming a beam of a signal to be transmitted from a base station transceiver in a communication system having a communication channel between a base station and a mobile station and a return channel for data transmitted from the mobile station to the base station, the method comprising:

providing a codebook (C) of parameters that modify a transmitted signal:

providing a channel matrix (H) of parameters representing the properties of the channel;

transmitting a signal from the base station along a channel using an antenna comprising at least two elements;

receiving said transmitted signal in said mobile station and estimating a parameter in the channel matrix characteristic of the channel by selecting the value of a parameter in the codebook that minimizes a criterion;

transmitting an indication of the selected parameter over the return channel; and

applying the codebook vector associated with the selected parameter to subsequent transmissions from the base station.

2.(Original) A method according to claim 1, in which an eigenvector of said channel matrix is provided by a calculation based on said parameter.

3.(Original) A method according to claim 2, in which said calculation is performed in said mobile station.

4.(Original) A method according to claim 1, in which said base station transmits a set of initial setup signals that are used by the mobile station to estimate the parameters of the channel.

5.(Original) A method according to claim 4, in which an eigenvector of said channel matrix is provided by a calculation based on said parameter.

6.(Original) A method according to claim 5, in which said calculation is performed in said mobile station.

7.(Original) A method according to claim 1, in which the signal is divided into frames and the process of estimating a parameter, transmitting an indication of the selected parameter and applying the codebook vector is repeated for each frame.

8.(Original) A method according to claim 7, in which an eigenvector of said channel matrix is provided by a calculation based on said parameter.

9.(Original) A method according to claim 8, in which said calculation is performed in said mobile station.

10.(Original) A method according to claim 1, in which said base station transmits a set of initial setup signals that are used by the mobile station to estimate the parameters of the channel.

11.(Original) A method according to claim 10, in which an eigenvector of said channel matrix is provided by a calculation based on said parameter.

12.(Original) A method according to claim 11, in which said calculation is performed in said mobile station.

13.(Original) A method of forming a beam of a signal to be transmitted from a base station transceiver in a communication system having a communication channel between a base station and a mobile station having two antennas and a return channel for data transmitted from the mobile station to the base station, the method comprising:

providing a codebook (C) of parameters that modify a transmitted signal:

providing a channel matrix (H) of parameters representing the properties of the channel;

transmitting a signal from the base station along two eigenvectors of a channel, the power allocation between said two eigenvectors being quantized independently from the quantization of the eigenvectors.

14.(Original) A method according to claim13, in which the quantization of the power allocation is performed at the receiver.

15.(Currently Amended) A method according to claim 13, in which $P_1 = kP_2$, where $0 \le k \le 1$, P_1 is the power in the dominant eigenvector and k is selected from the group comprising 1, ½, 1/5, and 0 ~~when $R = \frac{P_2}{P_1}$ is correspondingly ≥ 0.75, $0.5 < R < 0.75$, $.25 < R < 0.5$ and $0 < R < .25$.~~ .

16.(Original) A method according to claim 13, in which the dominant eigenvector is quantized by calculating the eigenvector in the relevant codebook that maximizes $\left\| H(C_i^1)^\dagger \right\|_2$.

17.(Original) A method according to claim 16, in which the second of two eigenvectors is calculated by finding that vector in an orthogonal subspace to the first eigenvector that maximizes the inner product with a beamformer codebook in the orthogonal subspace to the ~~first~~ said relevant codebook.

18.(Original) A method according to claim 16, in which the quantization of the power allocation is performed at the receiver.

19.(Currently Amended) A method according to claim16, in which $P_1 = kP_2$, where $0 \le k \le 1$, P_1 is the power in the dominant eigenvector and k is selected from the group comprising 1, ½, 1/5, and 0 ~~when $R = \frac{P_2}{P_1}$ is correspondingly ≥ 0.75, $0.5 < R < 0.75$, $.25 < R < 0.5$ and $0 < R < .25$.~~ .

20.(Original) A method of constructing a beamformer comprising the steps of:

providing a unitary space-time constellation of at least one signal i having a coherence time T and one transmit antenna and applying the constellation as a set of at least one beamforming vectors in an array of T antennas.

21.(Currently Amended) A method according to claim 20, in which said set of at least one ~~functions~~ beamforming vectors have the form

$$V_i = \frac{1}{\sqrt{n}} \exp\left(\frac{i2\pi j}{N}\right) \text{ where } j = 0,1,2 \ldots N-1 .$$

22.(Original) A method of constructing a beamformer of N vectors comprising the steps of:

providing a transmitter system having n transmit antennas;

forming a set of N functions in a unitary space time constellation with one antenna and a coherence time of n; and

applying said set of N functions as a set of N beamforming vectors.

23.(Original) A method according to claim 22, in which said set of N functions have the form

$$V_i = \frac{1}{\sqrt{n}} \exp(\frac{i2\pi j}{N}) \text{ where } j = 0,1,2 \ldots N-1 .$$

24.(Original) A method according to claim 20, of forming a beam of a signal to be transmitted from a base station transceiver in a communication system having a communication channel between a base station and a mobile station and a return channel for data transmitted from the mobile station to the base station, the method comprising:

providing a codebook (C) of parameters that modify a transmitted signal according to claim 20:

providing a channel matrix (H) of parameters representing the properties of the channel;

transmitting a signal from the base station along a channel using an antenna comprising at least two elements;

receiving said transmitted signal in said mobile station and estimating a parameter in the channel matrix characteristic of the channel by selecting the value of a parameter in the codebook that minimizes a criterion;

transmitting an indication of the selected parameter over the return channel; and

applying the codebook vector associated with the selected parameter to subsequent transmissions from the base station.

25.(New) A transceiver comprising:

a receiver for receiving a first signal from a sender over a channel from at least two transmit antennas;

a computer readable storage medium for storing a codebook C of parameter;

circuitry coupled to the codebook and to the receiver for estimating a parameter of a channel matrix of the channel by selecting a value of a parameter in the codebook that minimizes a criterion; and

a transmitter for transmitting to the sender an indication of the selected value of the parameter prior to receiving a second signal from the sender.

26.(New) The transceiver of claim 25, wherein said circuitry further is for determining an eigenvector of said channel matrix based on the estimated parameter.

27.(New) The transceiver of claim 25, wherein said circuitry estimates the parameter of the channel matrix using a set of initial setup signals received with the first signal.

28.(New) The transceiver of claim 25, wherein the circuitry is for estimating a parameter of a channel matrix of the channel by selecting a value of a parameter in the codebook that minimizes a criterion for each frame of received signals.

29.(New) The transceiver of claim 1 disposed within a mobile station.

30.(New) A transceiver comprising:

first circuitry for quantizing at least two eigenvectors for a signal to be transmitted;

second circuitry for quantizing a power allocation among the at least two eigenvectors in a manner that is independent of the quantizing the at least two eigenvectors; and

a transmitter for transmitting the signal along the at least two eigenvectors with the quantized power allocation among the at least two eigenvectors.

31.(New) The transceiver of claim 30, wherein the first circuitry comprises a receiver for receiving a wireless message that includes the quantized power allocation.

32.(New) The transceiver of claim 30, wherein the power for the dominant eigenvector is P_1 and for a less dominant eigenvector is P_2, the power allocation being $P_1=kP_2$; where k is selected from the group 1, 0.5, 0.2, and 0.

33.(New) The transceiver of claim 30, wherein the first circuitry quantizes a dominant eigenvector of the at least two eigenvectors by calculating that eigenvector in a codebook C that maximizes $\left\|H(C_i^1)^\dagger\right\|_2$ for a channel matrix H.

34.(New) The transceiver of claim 33, wherein the first circuitry quantizes a non-dominant eigenvector of the at least two eigenvectors by finding that vector in an orthogonal subspace to the dominant eigenvector that maximizes an inner product with a beamformer codebook in the orthogonal subspace to the said codebook C.

35.(New) A transceiver comprising:

a receiver for receiving at least one signal i in a coherence interval T;

circuitry for applying a unitary space-time constellation of the at least one signal i as a set of at least one beamforming vectors in an array of T antennas.

36.(New) The transceiver of claim 35, wherein the set of at least one beamforming vectors having the form

$$V_i = \frac{1}{\sqrt{n}}\exp(\frac{i2\pi j}{N}) \text{ where } j = 0,1,2...N-1$$

37.(New) A transceiver comprising:

a plurality of n transmit antennas;

circuitry for forming a set of N functions in a unitary space time constellation with one antenna and a coherence time of n; and

a transmitter for applying said set of N functions as a set of N beamforming vectors to a signal to be transmitted.

38.(New) The transceiver of claim 37, wherein the set of N functions are of the form

$$V_i = \frac{1}{\sqrt{n}}\exp(\frac{i2\pi j}{N}) \text{ where } j = 0,1,2...N-1$$

39.(New) A program of machine-readable instructions, tangibly embodied on an information bearing medium and executable by a digital data processor, to perform actions directed toward determining a parameter usable for beamforming, the actions comprising:

for a channel matrix that is representative of a channel over which a signal was received, estimating a parameter in the channel matrix by selecting the value of a parameter in a codebook that minimizes a criterion, wherein the codebook is also tangibly embodied on an information bearing medium.

40.(New) A program of machine-readable instructions, tangibly embodied on an information bearing medium and executable by a digital data processor, to perform actions directed toward transmitting a beamformed signal, the actions comprising:

quantizing at least two eigenvectors of a channel;

receiving over a wireless channel an indication of power allocation among the at least two eigenvectors; and

transmitting a signal along the at least two eigenvectors using a power allocation consistent with the received indication.

41.(New) The program of claim 40, wherein quantizing at least two eigenvectors comprises calculating a dominant one of the two eigenvectors in a codebook that maximizes $\left\|H(C_i^1)^\dagger\right\|_2$, said codebook also tangibly embodied on an information bearing medium.

42.(New) The program of claim 41, wherein quantizing at least two eigenvectors comprises calculating a non-dominant one of the two eigenvectors by finding that vector in an orthogonal subspace to the dominant eigenvector that maximizes the inner product with a beamformer codebook in the orthogonal subspace to the said codebook.

43.(New) A program of machine-readable instructions, tangibly embodied on an information bearing medium and executable by a digital data processor, to calculate a beamforming function in a unitary space time constellation, said beamforming function being of the form

$$V_i = \frac{1}{\sqrt{n}}\exp\left(\frac{i2\pi j}{N}\right) \text{ where } j = 0,1,2\ldots N-1$$

44.(New) A transceiver comprising:

a transmitter for sending over a channel a first message to a recipient;

a receiver for receiving a reply from the recipient, said reply comprising information concerning the channel;

a processor for beamforming a second message using the information, said second message being transmitted by the transmitter to the recipient along at least two eigenvectors.

45.(New) The transceiver of claim 44, wherein the information comprises an indication of a value of a parameter in a codebook that minimizes a criterion.